

- interior passenger compartment;
- c) Means to process said received illumination to create an electronic signal characteristic of the contents of said passenger compartment;
  - d) Means to categorize said electronic signal; and
  - e) Output means in response to said categorization to affect another system within said vehicle.

*11/16/12* 2. The invention in accordance with claim 1 wherein said object is a rear facing child seat.

*379-58 455?* 3. The invention in accordance with claim 1 wherein said output is information on the number of occupants in said vehicle and said other system is a vehicle communication system.

*381-86 12/17/12* 4. The invention in accordance with claim 1 wherein said output is information on specific seat occupancy and said other system is a vehicle entertainment system.

*AS-19 10* 5. The invention in accordance with claim 1 wherein said output is information on seat occupancy and said other system is a vehicle heating and air conditioning system.

*7* 6. The invention in accordance with claim 1 wherein said occupying item is at least an occupant, said invention further comprising means to measure the temperature of said vehicle occupant.

*5* 7. The invention in accordance with claim 6 wherein said occupant temperature is a further output to a vehicle heating and air conditioning system.

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C)*  
8. The invention in accordance with claim 1 wherein said illumination comprises acoustic radiation.

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9. The invention in accordance with claim 1 wherein said illumination comprises electromagnetic radiation.

## **IDENTIFICATION**

10. In a motor vehicle having an interior passenger compartment containing at least one occupying item having surfaces, an interior monitoring system comprising:

- a) Means to illuminate a portion of said vehicle interior passenger compartment said portion containing said occupying item;
- b) Means to receive reflected illumination from said surfaces of said occupying item;
- c) Means to process said received illumination to create an electronic signal characteristic of said occupying item;
- d) Computational means to identify said occupying item within said passenger compartment from said electronic signal; and
- e) Output means in response to said identification to affect another system within said vehicle.

11. The invention in accordance with claim 10 wherein said object is a rear facing child seat.

12. The invention in accordance with claim 10 wherein said output is information on the number of occupants in said vehicle and said other system is a vehicle communication system.

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13. The invention in accordance with claim 10 wherein said output is information on seat occupancy and said other system is a vehicle entertainment system.
  14. The invention in accordance with claim 10 wherein said output is information on seat occupancy and said other system is a vehicle heating and air conditioning system.
  15. The invention in accordance with claim 10 wherein said occupying item is at least an occupant and said invention further comprises means to measure the temperature of said vehicle occupant.
  16. The invention in accordance with claim 15 wherein said occupant temperature is a further output to a vehicle heating and air conditioning system.
  17. The invention in accordance with claim 10 wherein said illumination comprises ultrasonic radiation.
  18. The invention in accordance with claim 10 wherein said illumination comprises electromagnetic radiation.

#### **IDENTIFICATION + RANGING**

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20. In a motor vehicle having an interior passenger compartment having a front seat, said compartment having contents comprising objects and at least one occupant, an interior monitoring system comprising:

- a) Means to identify at least one of said contents;
- b) Means to determine the location of said identified contents within said passenger compartment; and,
- c) Output means in response to said location determination to affect another system within said vehicle.

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21. The invention in accordance with claim 20 wherein said identified contents comprises an occupant.

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21. The invention in accordance with claim 21, said vehicle further comprising a rear seat, wherein said other system is an airbag system for frontal impact protection of the occupants of the front seat of the vehicle.

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23. The invention in accordance with claim 21 wherein said other system is an airbag system for frontal impact protection of the occupants of the rear seat of the vehicle.

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24. The invention in accordance with claim 21 wherein said other system is an airbag system for side impact protection of the occupants of the vehicle.

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24. The invention in accordance with claim 21 further comprising means to compare the position of said occupant at different times after an accident and to thereby determine motion of said occupants and wherein said other system is a vehicle communication system.

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26. The invention in accordance with claim 21 wherein said other system is an airbag system and means are further provided to determine the velocity of said occupant from successive

location measurements.

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27. The invention in accordance with claim 21 wherein said other system is a gas generator of an airbag system, said gas generator being of the variable inflation rate type and said invention further comprising means to control the inflation rate of said variable inflation rate inflator based on the position of said occupant.

*57*  
28. The invention in accordance with claim 21 wherein said other system is an electronic crash sensor for an airbag system said sensor having a setable threshold triggering level and said invention further comprising means to determine seatbelt usage of the occupant, said seatbelt usage being a factor in the setting of the sensor threshold.

*28*  
30. In a motor vehicle having an interior passenger compartment having contents comprising objects and at least one occupant, an interior monitoring system comprising:  
a) Means to identify at least one part of one of said occupant;  
b) Means to determine the location of said identified part within said passenger compartment.  
c) Output means in response to said location determination to affect another system within said vehicle.

*29*  
31. The invention in accordance with claim 30 wherein said part of said occupant is the head.

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32. The invention in accordance with claim 31 further comprising a directional microphone having a setable direction determined by said location of said head of said occupant.  
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329 33. The invention in accordance with claim 32 wherein said microphone is part of a vehicle telephone system.

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381-72 ( 34. The invention in accordance with claim 32 wherein said microphone is part of a vehicle interior communication system.

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35. The invention in accordance with claim 30 wherein said part of said occupant are the eyes.

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36. The invention in accordance with claim 30 wherein said other system is a rear view mirror.

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37. The invention in accordance with claim 30 wherein said other system is an adjustable seatbelt anchorage system.

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38. The invention in accordance with claim 30 wherein said other system is an adjustable headrest system.

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39. The invention in accordance with claim 30 wherein said other system is a window closing system.

#### IDENTIFICATION + LOCATION + EXTERNAL STIMULUS

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40. In a motor vehicle having an interior passenger compartment having (i) at least one occupant, said occupant having eyes, (ii) a windshield and (iii) a rear view mirror, a monitoring system comprising:

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a) Means to determine the direction of an external light source;

- b) Means to determine the location of the eyes of said occupant; and,
- c) Means responsive to the direction of said external light source and said location of said eyes to automatically activate a light filter between said external light source and the eyes of said occupant.

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41. The invention in accordance with claim 40 wherein said external light source is a headlight of a vehicle.

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42. The invention in accordance with claim 40 wherein said filter comprises electro-chromic glass.

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43. The invention in accordance with claim 40 wherein said filter comprises a liquid crystal film.

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44. The invention in accordance with claim 40 wherein said vehicle windshield comprises said filter.

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45. The invention in accordance with claim 43 wherein said filter limits the amount of light passing through a selected portion of said windshield.

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46. The invention in accordance with claim 40 wherein said vehicle rear view mirror comprises said filter.

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47. The invention in accordance with claim 45 wherein said filter limits the amount of light reflected from a selected portion of said rear view mirror.

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50. In a motor vehicle having an interior passenger compartment having at least one occupant, said occupant having ears, a monitoring system comprising:

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- a) Means to determine the presence and direction of a source of unwanted sound;
  - b) Means to determine the location of the ears of said occupant; and,
  - c) Means responsive to the direction of said unwanted sound and said location of said ears to automatically generate and transmit sound waves to cancel the unwanted sound at the ears of said occupant.

#### LOCATION OF RESONATOR

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60. In a motor vehicle having an interior passenger compartment having doors, windows and containing objects, an interior monitoring system comprising:

- a) Means to illuminate a portion of said vehicle interior passenger compartment with energy at at least one frequency;
- b) Resonator means, responsive to said illumination, attached to at least one of said doors, windows and objects having a resonant frequency at nearly the same frequency as said at least one illumination frequency;
- c) Means to receive resonant illumination from said resonator means;
- d) Means to process said received resonant illumination to determine the location of said illuminated resonator; and,
- e) Output means in response to said illuminated resonator location determination to affect another system within said vehicle.

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61. The invention in accordance with claim 60 wherein said motor vehicle further comprises a seat and said resonator means is attached to said seat to determine at least one of the location and

orientation of said seat within said passenger compartment.

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62. The invention in accordance with claim 60 wherein said motor vehicle further comprises a seatbelt system and an airbag system, said system comprising an electronic crash sensor having a variable deployment threshold, wherein said resonator means is attached to said seatbelt to determine, by its position, the use of said seatbelt by said occupant to affect the deployment threshold of said crash sensor.

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63. The invention in accordance with claim 60 wherein said resonator means is attached to at least one of said vehicle windows to determine the degree of openness of said window.

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64. The invention in accordance with claim 60 wherein said resonator means is attached to said vehicle in such a manner as to determine, in conjunction with said illumination means and said receiver means, whether said door is closed.

#### OCCUPANT RECOGNITION

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70. In a motor vehicle having an interior passenger compartment containing at least one occupant, an occupant recognition system comprising:

- a) Means to illuminate said occupant;
- b) Means to receive reflected illumination from said occupant;
- c) Means to process said received illumination to create an electronic signal characteristic of the occupant;
- d) Means to identify said occupant from said electronic signal; and
- e) Output means in response to said identification to affect another system within said vehicle.

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71. The invention in accordance with claim 70 wherein said other system is a vehicle security system, said invention further comprises means to prevent operation of said vehicle if said occupant recognition system fails to recognize said occupant. \*
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72. The invention in accordance with claim 70 wherein said other system is a system to record at least one operating parameter of said vehicle and associate said recording with said recognized occupant.
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73. The invention in accordance with claim 70 wherein said other system is a vehicle speed control system to limit the maximum speed which said vehicle can travel corresponding to said recognized occupant.
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74. The invention in accordance with claim 70 wherein said other system is a vehicle heating and air conditioning system.
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75. The invention in accordance with claim 70 wherein said other system is a vehicle suspension control system.
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76. The invention in accordance with claim 70 wherein said other system is a vehicle seat position control system.
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77. The invention in accordance with claim 70 wherein said other system is a vehicle entertainment system.
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78. The invention in accordance with claim 70 wherein said other system is a vehicle ignition system.

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**OCCUPANT ATTENTIVENESS DETECTION**

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80. In a motor vehicle having an interior passenger compartment containing at least one occupant, an occupant attentiveness detection system comprising:

- a) Means to illuminate said occupant;
- b) Means to receive reflected illumination from said occupant;
- c) Means to process said received illumination to create an electronic signal;
- d) Means to determine the attentiveness of said occupant from said electronic signal; and,
- e) Output means in response to said attentiveness determination to affect another system within said vehicle.

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81. The invention in accordance with claim 80 wherein said other system is warning light.

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